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Effects of acid deposition to forest ecosystem in monsoon evergreen forest in south China?Focus on behavior of metal?

Wataru Saito[1*], Yunting Fang[3], Jiangming Mo[2], Yoshimura Mayumi[3], Muneoki Yoh[1]

[1]Tokyo University of Agri. and Tech., [2]South China Botanical Garden, [3]FFPRI

With a rapid economic growth in recent years, Asian region has become one of the biggest industrial areas in the world. Pearl River Delta and their surrounding areas in South China is one of them. In previous study, it became apparent that there was heavy acidification: pH values of surface soil and stream water have 3.8, 4.0 respectively, in DingHuShan Biosphere Reserve (DHSBR) which is located some 75 kilometers west of the central Guangzhou city. Moreover, in DHSBR, N deposition and S deposition in through fall were 27 kg N $ha^{-1}yr^{-1}$, 67kg S $ha^{-1}yr^{-1}$ respectively, and these value were higher than those in developed country. Such acidification caused by deposition of acidifying materials has reported in Europe and the United States since the 1970's and the effects of acid deposition have widely been studied. However, there are few researches about it in Asia and tropic or sub-tropic zone including South China. It is kwon that effects of acid deposition to soil is different in different climate or different soil types. Consequently, we considered the effects of soil acidification to the living things especially trees by measuring metal concentrations in stream water, soil or living things in DHSBR and other two sites (Heshingding, Conghua) which have lower acid deposition but have similar climates. cr/
Soil was extracted with water, 1M ammonium acetate, or 1M hydrochloric acid and measured as water soluble fraction, 1M ammonium exchangeable fraction, or 1M hydrochloric acid exchangeable fraction respectively. Plant leaves and root, and insects samples were all digested with wet digestion method. The concentrations of each sample were measured with ICP-MS. Measured elements were Na, K, Mg, Ca, Al, Fe, Mn, Cu, Zn, Co, Ni, V, Cr, Sr, Cd, Pb. cr/
pH in each stream water was 3.9 in DHSBR, 6.3 in Heishiding and 5.8 in Conghua. This result reflects the amount of acid deposition. Results of element concentration in stream water showed Al in DHSBR was much higher than other two sites. On the other hand, Na and K were higher in not so acidified (high pH) stream. This may suggest that watershed in the stream was so acidified that Na and K in soil were thoroughly decreased. cr/
Meanwhile, pH in surface soil was 3.8 in DHSBR, 4.2 in both Heishiding and Conghua and this showed surface soil was acidified even in lower acid deposition sites. Then Al concentrations in soil were high in all forests, but the correlation between pH and Al value was not shown. Moreover, Ca /Al molar concentration ratios were less than 0.5. Ca/Al molar concentration ratio in soil water < 0. 5 is widely used in Europe and the United States as the threshold of 75% growth inhibition to the tree. cr/
Ca/Al molar concentration ratio in plant leaves < 12.5 is also used to know plant growth inhibition. In this research, plants which has Ca/Al < 12.5 ratio were three-fifth in DHSBR, three-seventh in other two sites. Also, the interspecies differences were so high even in same forest ecosystem that it was difficult to say that there was a correlation between Ca/Al in soil and in plant leaves. The lowest Ca/Al ratio was confirmed in one of the plant leaves corrected in Conghua where soil soluble Al concentration was lowest, and it had 2.50mmol Al kg^{-1}D.W.. cr/
Because of these results, it suggested that soil acidification in surface soil are so serious not only in DHSBR but also in low acid deposition area that there may be negative effects to plants in many forests around south China. But there are a lot of uncertain factors about soil acidification in South

China. So further study will be needed.

Keywords: Acid deposition, Soil acidification, Biological effect, Ca/Al molar ratio